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ABSTRACT

New technologies transform the world, creating implications for marketing education. How should marketing educators educate students in order to prepare them for occupations in the future marketing field? Answers to this and similar questions depend on point of view. Technological innovations have implications for marketing educators in all fields. Some of the areas that will be affected include agriculture, health care and maintenance, computerized information systems, power energy, and transportation. If marketing students are to understand technology in marketing, they must (1) be educated about the implications of technology in marketing; (2) experience advancing technology and its impact through on-the-job training, field trips, and multimedia presentations; (3) develop career plans related to each of the emerging technologies and relate each of these to the marketing field; (4) be equipped with a minimum level of computer literacy in order to take their place in a competitive world that is more and more dependent on knowledge acquired through information processing; (5) understand that value decisions accompany advances in technology particularly as it affects marketing; (6) develop an understanding of the interrelatedness of technologies; and (7) develop an appreciation for the fact that technology is a servant of people to meet needs. (Abstracts of 25 research reports on technology in marketing are included in this report.) (KC)

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A SPECIAL REPORT 1986

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TECHNOLOGY

IN

MARKETING

A SPECIAL REPORT

BY

DR. RONALD R. HARRIS

MONTANA STATE UNIVERSITY

JUNE, 1986

Preface

This special report; Technology In Marketing, was sponsored by the office of Public Instruction through a grant proposal submitted by Dr. Ron Harris, Director of Cooperative Education and a faculty member in the College of Business at Montana State University.

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American society is presently undergoing a profound change. Futurist Herman Kahn refers to it as "The Great Transition, having perhaps as its only historic parallel the Industrial Revolution of the 19th Century. For the past 200 years it has been industry, first steam-powered, and then oil-driven, which enriched our world and shaped our present consciousness. But in the 1980's we are moving rapidly into what many have referred to as the "information society". The technological revolution is transforming our society, (and many would argue our economy) into one that is more and more based on the creation and distribution of information, and less and less dependent on traditional industrial bases.

As these new and revolutionary technologies transform our world, in their wake is spawned a series of implications for marketing education. Exactly how should marketing educators educate marketing students in order to adequately prepare young men and women for occupations in the marketing field? What minimum technical bases concerning the technological revolution and its present and potential impact on civilization should students be equipped with in order to be responsible world citizens? What are the minimum skills that should be required of all students in order to make them manipulators of information instead of manipulated by information? What are the humanistic implications of advancing technology?

While these and dozens of other questions cry out to us for answers, their answers are in large part dependent upon our frame of reference and

the way that we define technology. Technology, strictly defined is the application of "knowledge and activity to the needs and wants of people." Note that technology is, of necessity, identified as it relates to "the needs and wants of people." Marketing professionals consistently struggle to overcome the notion that technology is divorced from human considerations. Too often are we presented with a false dichotomy - between advancing technology on the one hand and the technical, scientific and humanistic considerations of people on the other. This is simply a false dichotomy: people are never divorced from technology but are in effect integrally connected and entwined with it.

Consider the relationship between technology and people that Dr. Ralph Hardy, President of Bio-Technica International and professor of life sciences at Cornell University, presents:

> What will happen to the dairy industry when bovine growth hormone, produced by genetic engineering, starts producing 40% increases in milk yields--when there are already huge dairy surpluses? The major theme of scientific research in recent years has been ethical or value issues in the development and use of new scientific or technological methods for decision-making.

It has long been recognized that technological change is one of the major forces reinforcing a market structure in various industries. This has been true in the chemical and petroleum industries, steel industries and drug industries (Mansfield). The consensus of most researchers is that

a relatively rapid rate of technological change in a particular industry is likely to result in a relatively high level of concentration (Nelson and Winter, 1978) and (Levin, 1980). For example, in the four industries cited above, the minimum efficient scale of plant was increased substantially in all of the industries in which modern data are available.

How do these changes impact marketers, marketing educators and prospective marketing employees? In answer to the first area - marketers - consider how one demographic segment of consumers, the elderly, accept various technologies. Two researchers recently conducted a study to investigate the elderly's acceptance and adoption of several key technologies: scanner equipped grocery stores, electronic funds transfer, automated teller machines, and custom telephone calling services. As Gilly and Zeithaml point out in their article "The Elderly Consumer and Adoption of Technologies", adoption of innovations is a process rather than an instantaneous event. Rogers (1983) in fact, cites five steps involved in acceptance and adoption of innovations:

1. KNOWLEDGE. The individual becomes aware of the innovation's existence and gains understanding of its function.
2. PERSUASION. The individual develops a favorable or unfavorable attitude toward the innovation based on the information acquired.
3. DECISION. The individual engages in activities (such as trial) that lead to a decision to adopt or reject the innovation.

4. IMPLEMENTATION. The individual puts the innovation to use.

5. CONFIRMATION. The individual seeks reinforcement of the innovation decision already made.

As Gilly and Zeithaml point out in their article, the elderly exhibit several different characteristics (as demonstrated by marketing research): Consider these findings:

- the elderly are less likely to use different sources of information (Phillips and Sternthal, 1977)
- less likely to adopt and try new technologies (Kerschner and Chelsvig, 1981)
- less aware of retailing innovations than the nonelderly population (Bearden and Mason, 1979)
- depend on mass media and family more than on friends or neighbors as information sources, and on print media more than broadcast media (Phillips and Sternthal, 1977).

Just by knowing these few characteristics of the elderly as one class of consumers should immediately alert the marketer as to the distinctions of this unique market segment. The alert marketer should begin asking questions such as:

- How do I encourage the elderly to try a new technological innovation in the marketplace?
- If the elderly depend on family and mass media print to make purchasing decisions, how can this knowledge be

effectively translated to impact this marketing segment?

- How can the elderly's lack of awareness of retailing innovations be overcome in introducing new products?

Additional questions might center around the variance in product life cycle among the elderly, or post-decisional dissonance related to technological products purchased, or degree of product loyalty after the decision to purchase products such as microwave ovens, autos with eletronic ignition or automatic electronic sprinkling systems. In short, marketers are, or should be concerned with the impact of technology on various market segments, as represented by the brief discussion of the elderly above.

The second group to be impacted by advancing technology are marketing educators. As the Montana Advisory Council on Vocational Education pointed out in 1985:

> The State Advisory Council for Vocational Education recommends that the Office of Public Instruction continues to develop and refine the public educational system to assure that graduates have the opportunity to develop an intellectual foundation needed to understand technology, its impact and application in communities, and the importance of a positive attitude toward effective use of technical innovations.

In order to "develop an intellectual foundation needed to understand technology, its impact and application in communities" technology must be

briefly examined in each of the following areas: Agriculture, Health Care and Maintenance, Computerized Information Systems, Power Energy and Transportation.

AGRICULTURE:

Agricultural technology elicits many different reactions among people. To the consumer, it means sanitized dairy procedures, large mechanized farming operations and consistent meat cutting and grading. To the farmer, it means dramatic gains in productivity through improved fertilizers, better irrigation systems and hybrid seed concoctions. To the scientist, agricultural technology means deep soil studies, genetics engineering and new products not conceived of, even a year or two ago.*

The technology of agriculture involves several different parts. Consider these:

- Land preparation
- Cultivation
- Irrigation
- Harvesting
- Storing and Handling Crops
- Food processing
- Breeding and Development

*Consider two researchers at Montana State University who are experimenting with creating a "sweet wheat", innovation that could transform the agricultural marketplace.

As any good farmer or rancher can testify, there is much technology involved in each of these areas.

In addition, computers are increasingly being used in farming operations nationwide. One particular computer program enters soil and land condition, system of rotation used in the past, weather conditions and several other factors. In a matter of seconds, recommendations emerge as to which particular crop should be planted, expected results and probable profit or loss (projecting market conditions). Ranchers are increasingly finding uses for computers in analyzing feeding operations, keeping track of weight gains through mixed portions of grain, selecting rural market conditions and other similar applications.

Finally, root crops, grains, legumes, tree crops and vine crops all require very specialized technologies. Whether planting, cultivating or harvesting (or any of the many processes in-between these major categories) specific techniques, supplemented by technological improvements in machinery, chemicals and irrigation enable the farmer/rancher to produce more and better crops.

HEALTH CARE

Amazing technological advances have been made in health care. People have been more health conscious at precisely the same time that significant attention has focused on health care prevention. Therefore technology has once again served the functions of "meeting the needs and wants of people."

In general, emerging health care technologies may be divided into the following categories:

- Diagnostic Technology - a wide range of instruments and equipment have been developed to assist in diagnosis and treatment of diseases.
- Monitoring Technology - most hospitals display a wide range of monitoring equipment, in, for example, recovery wards and emergency rooms.
- Chemical Technology - a wide variety of chemical analysis can be performed on many body functions, including blood tests, excreting fluids, etc.
- X-Ray Technology - an old and established technology that is familiar to most people.
- Computer Technology - as with many of the uses of the computer, techniques now make possible three dimensional analysis of conditions within the body.

Almost every time an individual visits a doctor, dentist or hospital some form of advanced technology is utilized to assist in diagnosis, recovery and prevention of illness and/or disease. From a marketing standpoint, every time one of these forms of technology is utilized, it is interesting to note that, for example, the diagnostic machine had to be developed, marketed (four P's - price, product, plane and promotion) and ultimately sold to the facility. Of course significant marketing research accompanied the effort.

COMPUTERIZED INFORMATION SYSTEMS

Processing of data through an information processing system is what computers are all about. In order for computer usage to be maximized, the following are required:

- Adequately trained computer personnel to design and write programs that computers follow; to set up and operate equipment; to input information and monitor work done by computers.
- Systems development that will easily transform data into information.
- Methods that perform the functions of input, output, processing and storage.

Since computers process data and produce information, people play the key role of developing knowledge from the data and information. It is in the effective usage of information that people, through their creative imagination and skill, generate knowledge that is useful in performing work on specified tasks related to the work endeavor. From this brief description several key concepts emerge:

1.) Data represents the raw facts, figures, etc. with which computer machinery works. Of course the key to understanding data is understanding relationships, which leads to our second point.

2.) Facts and figures do not have substantial meaning until a relationship among them is made. A customer group

may average 25 years of age. But until this factor is related to occupation, number of items they typically purchase and so forth, the factor of age has little value.

3.) From relationships of data emerge information. Information emerges from the relating or processing of data.

4.) Knowledge comes from information. For example, when information about average age group, occupation, average earnings, etc. is collected, this information becomes knowledge when people relate it to something. In this case, this information could be related how to best market products to this market segment, given the data above.

5.) People generate data that is subsequently used by others to make knowledgeable decisions. For example, most retail store price tags contain several very useful pieces of information that is used to: a) replenish depleted product lines, b) estimate the subsequent number of products to order, c) establish which products are moving quickly and which are not, d) calculate the amount of sales created and in which hours of the day, e) calculate the amount of sale of a given item, f) determine who sold the item and where they

were working at the time, and g) determine the time of the sale.

In summary, an understanding of computers and information systems is critical to an understanding of the way in which knowledge is utilized in the marketing field. Marketing educators are constantly on the alert for ways to teach the implications of technology through computers in marketing education classrooms. Examples abound of the way in which data is translated to information and then used to generate knowledge for decision-making in marketing.

POWER AND ENERGY

The notion of power and energy has become increasingly intertwined with technology. Power - which represents the rate at which work is accomplished - has exploded over the past thirty years. By combining force and movement - two key ingredients of power - dramatic gains have been made in:

- Thrust force as represented by Turbine and Rocket engines. Expanded gas is used as a source of thrust force by air and fuel, once burned, being forced out of the rear of the engine. Of course, forced air causes the jet or rocket to move, or be thrust, forward.

- External Combustion systems as represented in steam engines. By heating a boiler of water, steam is created which expands into a tubular enclosure called a cylinder. As the cylinder holds the steam, pistons move along the cylinder as steam is fed from the opposite end. As the piston moves, force is transferred from the piston to the piston rod and then to the connecting rod. This connecting rod is connected to a wheel, for example, which causes the wheel to move.
- Internal combustion systems as represented by the automobile engine. This category is separated from jet engines above, even though jet engines operate on a combustion principle. The reason is that all of the combustion takes places internally in order to produce power to a rod. The author regards the development of jet power to be such a revolutionary development that it requires an entirely different category of power.

It is virtually impossible to think about technology without thinking of these developments in thrust force. Our daily lives are inextricably linked to all forms of power and its development. Marketing educators realize that for goods to be produced and shipped to market, power technology is at the very heart of the marketing system.

Similarly, energy is a form of power that dramatically alters our lives. Whether it is water running over a wheel to produce power to run electrical machines or wind turning the vanes of a windmill to provide electric power to a lightbulb, energy provides power to alter our lives.

There are basically two types of energy sources;

- Kinetic Energy - The wheel turning described above is an example of kinetic energy. As long as water keeps running over the wheel, kinetic energy emerges. In this state, kinetic energy is being applied to turn the wheel.
- Potential Energy - Any place where energy is stored for future use is an example of potential energy. An excellent example of this is water behind a dam. Its release will generate enormous energy. As long as it remains behind the dam it is an example of potential energy.

Of course, electricity is our best known form of energy. Without electricity no form of marketing effort could take place, at least not in the quality or quantity of merchandise to which we are accustomed. Technology in the electrical form of energy has transformed our lives through the application of massive energy forms to the manufacturing and design processes as well as the aforementioned computer systems area.

TRANSPORTATION

Transportation represents perhaps the most integrated form of technological useage in our modern day. A series of technologies are combined in the materials handling area as well as the transportation area. Transportation systems today include:

- A modern, well-developed highway system encompassing thousands of miles of highways. Truck transportation is a primary means of moving goods to the marketplace.
- A complex system of aerospace/military represented by aircraft, missiles, space vehicles and other weapons.
- An emerging communications system that is no longer tied to wires and cables but is increasingly dependent on microwave, laser and fiber optics, and satellites. Each of these developments provide long term signal transmission at a fairly low price.
- The utilization of information processing computers to assist in transportation of banking services, publication of newspapers, broadcast information provided to the mass media, education provided in school systems, research conducted at universities and within private industry through Research and Development departments and office automation through integrated information systems.

Technological developments in transportation, therefore, involve more

than the traditional understandings of trucks, trains and airplanes. Today's marketing efforts are dramatically impacted by these broad-based developments in technology. Technology in marketing, therefore involves some rather revolutionary happenings in the transportation field.

Finally, how does technology in marketing affect prospective marketing employees? To describe the various areas in which technology is having a major impact and divorce it from the "employee" level - the people level - would be a grave disservice. If marketing students are to truly understand Technology in Marketing, they must:

1.) Be educated as to the implications of technology in marketing as it has been described above. A firm intellectual foundation must be built while at the same time showing the implications of these technologies for all of life.

2.) Experience advancing technology and its full impact through on-the-job training efforts, field trips and multi-media presentations. Experience remains the best teacher of the young, particularly when coordinated with related classroom instruction.

3.) Develop career plans related to each of the emerging technologies and relate each of these to the marketing field.

4.) Be equipped with a minimum level of computer literacy in order to take their place in a competitive world that is more and more

dependent on knowledge acquired through information processing.*

5.) Understand that value decisions accompany advances in technology particularly as it affects marketing. For example, while tremendous information can be gained from information - specific information systems from say, credit application companies, this information comes at a price. In this case, the price represents a loss of privacy that is particularly acute in the credit information field. Technology, therefore, has both good and bad consequences, and involves value decisions related to use of information systems.

6.) Develop an understanding of the interrelatedness of technologies. Technical developments in transportation affect the health care field while technological power developments affect transportation and health. As our world has become more interdependent so have the technologies.

7.) Develop an appreciation for the fact that technology, as was explained in the opening pages of this report, is a servant of people to meet needs. For technology in marketing to be truly understood and accepted, these needs must be understood. If

*Incidentally, hands-on, menu-driven program experience does not alone qualify as computer literate in this discussion. Students must be taught to draw relationships between various pieces of data, figures, etc. in order to maximize computer usage and thereby become computer literate. Pushing buttons for menus does not constitute literacy.

not, application of technology is not made, and therefore, is of little value.

STATE OF RESEARCH IN TECHNOLOGY IN MARKETING

Technology in Marketing is a little understood field with little research being conducted and most of what is produced is very esoteric and with little practical value. This author, along with Dr. John Rogers, exhaustively explored through research this field over the past year and found no practical research in the field. The meager results of these research efforts is detailed in this section, which outlines the author, article, publication in which the article appears and a brief synopsis of the article which is taken from the literature. Again the point must be stressed that these are the only articles that tie together marketing, marketing education and technology.

These abstracts begin on page 18.

KEY RESEARCH ARTICLES

ON

MARKETING, MARKETING EDUCATION AND TECHNOLOGY

Spenner, Kenneth I. The Upgrading and Downgrading of Occupations: Issues, Evidence, and Implications for Education. Review of Educational Research, v55 n2 p125-54 Sum 1985.

A debate which is concerned with skill upgrading versus downgrading of occupations in the United States and relationships to schooling and vocational preparation is reviewed. The article summarizes major position, surveys the evidence on skill changes, and discusses research and policy implications for general and vocational education. (Author/DWH)

Descriptors: Automation; Economic Change; *Educational Change *Education Work Relationship; Improvement Programs; Industrialization; *Job Skills; Literature Reviews; Skilled Occupations; *Technological Advancement; Technological Literacy; Vocational Education

Identifiers: United States

Schnek, Peter and Pieter Tordoir. University-Industry Cooperation: Preferences and Interests and Small-and Medium-Sized Firms in the Amsterdam Region, The Netherlands. International Journal of Institutional Management in Higher Education, v8 n2 p147-57 Jul 1984.

Results of a survey of Amsterdam-area industries concerning university-industry cooperation and technology transfer are reported. Industries prefer R&D and consulting and indicate great interest in what the universities can offer in such relationships. However, they feel universities should initiate contact. Further cooperative strategies are discussed. (Author/MSE)

Descriptors: College Administration; *College Role; Foreign Countries; Higher Education; Industry; Marketing; * Regional Cooper-

ation; *Research and Development; *School Business Relationship; Surveys; *Technology Transfer; Universities

Identifiers: *Netherlands (Amsterdam)

Ettema, James S. Videotex for Market Information: A Survey of Prototype Users. New Directions for Program Evaluation, n23 p5-21 Sep 1984.

Formative evaluation of a prototype system can help developers to refine a product and define a market. A survey of adopters and non-adopters of a prototype videotex system, when coupled with machine-collected data about system usage, provided rich information for that purpose. (Author)

Descriptors: *Agriculture; *Formative Evaluation; Marketing; Social Change; Surveys; Technology Transfer; Use Studies; *Videotex

Identifiers: *Market Research; Prototypes; Stakeholders

Mayo, John K. and others. The Transfer of "Sesame Street" to Latin America. Communication Research: An International Quarterly, v11 n2 p259-80 Apr 1984.

Analyzes the transfer of "Sesame Street" to Brazil and Mexico. Explains how the short-run success and long-run failure of the transfer can be found in the nature of the supplier-receiver relationships and in the emphasis on product transfer rather than process modification and adjustment. (PD)

Descriptors: *Childrens Television; *Educational Television; Formative Evaluation; Marketing; Preschool Education; *Program Evaluation; Programming (Broadcast); *Technology Transfer; Television Viewing

Identifiers: Brazil, *Latin America; Mexico; *Sesame Street

Bottoms, Gene. A Response to the National Reports. NASSP Bulletin, v68 n470 p27-29 Mar 1984.

Arguing that vocational education has potentially an important role in raising all students' technological knowledge base and that work-bound students will be hurt by additional academic requirements, the director of the American Vocational Association expresses concern about recent national commission reports prescribing a classical academic curriculum for all students. (MJL)

Descriptors: *Educational Change; School Business Relationship; Secondary Education; *Secondary School Curriculum; Student Needs; Technological Literacy; *Vocational Education

Identifiers: Action for Excellence; *American Vocational Association; A Nation at Risk

Campbell, Richard S. Patenting the Future: A New Way to Forecast Changing Technology. Futurist, v17 n6 p62-67 Dec 1983.

Patent trend analysis, a process developed at Batelle Pacific Northwest Laboratories, can help businesses understand the direction of technological change and compete more effectively in the marketplace. The procedure involves tracking the linkages among new patents in an area, the age of earlier patents cited, and the companies involved. (IS)

Descriptors: Business; *Futures (of Society); Information Dissemination; Inventions; Marketing; *Patents; *Prediction; Research Utilization; *Technological Advancement; Technology Transfer

Identifiers: Battelle Pacific Northwest Laboratories

Dyrenfurth, Michael J. The Route to Technological Literacy. VocEd, v58 n1 p42-44 Jan-Feb 1983.

Describes the dimensions of technological literacy, the capacity to use and work with technology intelligently. Provides examples of ways in which technological literacy can be developed through each

of the service areas of vocational education. (SK)

Descriptors: Problem Solving; *Technological Advancement; *Technological Literacy; Technology; *Vocational Education

Roblyer, M.D. Investing in the Future: Computers in Florida Education. Florida Vocational Journal, v5 n9 p18-21 Jun 1980.

The increased availability of computers is affecting education along two fronts. First, the vocational curriculum must meet the demand for trained data-processing personnel and for computer-related skills in other occupations. Second, three major tools (computer-assisted instruction, computer-managed instruction, and computer-assisted guidance) are changing teaching methods in many disciplines. (SK)

Descriptors: *Computer Assisted Instruction; Computer Managed Instruction; *Computer Science Education; *Data Processing Occupations; *Demand Technical Occupations; Vocational Education

Identifiers: Emerging Occupations; Florida; Technological Literacy

Paul, Sandra K. and Susan Kranberg. The Future of the Book. Part III. New Technologies in Book Distribution: The United States Experience. Studies on Books and Reading No. 18. Library of Congress, Washington, DC. Center for the Book.; SKP Associates, Washington, DC. United Nations Educational, Scientific, and Cultural Organization, Paris (France). 1984.

The third report from a comprehensive UNESCO Study, this document traces the history of the application of computer-based technology to the book distribution process in the United States and indicates functional areas currently showing the effects of using this technology. Ways in which computer use is altering book distribution management activities are examined, including ordering, order processing, delivery, payment processing, and warehouse functions. Following a brief introduction, the first section discusses the general use of computer technology, changes in book distribution

procedures, and the context and methodology of the report. Section II describes the activities of individuals, companies, and organizations whose efforts have brought about technological change in book distribution in the United States. Section III analyzes the various component steps in the distribution chain and the organizations involved in them; areas are highlighted which have already experienced change due to technological advances and areas where such changes can confidently be predicted to occur in the near future. The final section outlines the various types of organizations which participate in the introduction of new technologies to the distribution process, identifies individuals in key leadership roles, and suggests emerging trends for the future. (JB)

Descriptors: Automation; *Books; Computers; Data Processing; *Futures (of Society); Information Systems; Man Machine Systems; *Marketing; Online Systems; Organizational Change; *Publishing Industry; *Technological Advancement; *Technological Literacy

Technology - Oriented Job Preparation. Final Report. One American, Inc., Washington, D.C. Jun 1985 169p. Parts of this document contain small light type. Sponsoring Agency: Office of Vocational and Adult Education (ED), Washington, DC.

An extensive review of literature dealing with 263 technology-oriented vocational training programs was conducted to gather current information on the state of such training. Particular emphasis was placed on links between programs and government bodies or private sector entities and programs that could serve as models for those wishing to establish technology-oriented training programs. An overview of vocational education programs in the United States showed three approaches: (1) traditional school/business partnerships, (2) state-wide programs, and (3) trends embodied in the 1982 Job Training Partnership Act. Only one technology-oriented

program was identified from 139 of the 182 educational institutions represented, with 2 programs being identified in 25, 3 programs in 7, and 4 programs in 8 of the remaining institutions. Of the 13 major types of training identified, electrical or electronics and computer-related programs indicated a specific population being served. Of these programs, 44 percent were geared toward upgrading or retraining workers, 20 percent represented apprenticeship programs, and 13 percent served disadvantaged clients. Because of the conspicuous lack of the kind of detailed data needed to draw replicable models, the Department of Education should fund a field study of 25 selected programs to develop such a model. (Appendixes to this report include alphabetical listings of identified training arrangements.) (MN)

Descriptors: Demonstration Programs; Educational Needs; *Educational Practices; *Government School Relationship; Job Training; Labor Force Development; *Linking Agents; Literature Reviews; Models; Postsecondary Education; Program Content; Retraining; *School Business Relationship; Secondary Education; *Technical Education: Technical Occupations; Technological Advancement; Technological Literacy; Training Methods; *Vocational Education

Identifiers: *Private Sector

Naylor, Michele. Jobs of the Future. Overview. ERIC Digest No. 46. ERIC Clearinghouse on Adult, Career, and Vocational Education, Columbus, Ohio. 1985 3p.

Although 6 of the 20 fastest growing occupations are associated with high technology, only about 7 percent of all new jobs projected for the remainder of the century will be in high-tech areas. Bureau of Labor Statistics data indicate that far more job openings will occur in low- and entry-level occupations than in highly skilled or

professional occupations. Many analysts feel that it is still impossible to assess the impact of high technology on the labor market of the future and it seems highly unlikely that individuals will be able to hold the same job for the 40 or 50 years of their working lives. Therefore, vocational educators should concentrate on providing students with sound training in the basic and transferable skills, encouraging student participation in a system of recurrent or lifelong education, and developing a program of technological literacy education that would begin in the elementary grades and extend through the postsecondary grades. Most planners agree that, even at the postsecondary level, vocational educators should emphasize development of transferable skills and should, for the most part, leave job-specific training to those industries hiring vocational graduates. (MN)

Descriptors: *Educational Needs; Education Work Relationship; Elementary Secondary Education; Employment Patterns; *Employment Projections; *Futures (of Society); *Job Training; *Labor Market; Lifelong Learning; Needs Assessment; Postsecondary Education; School Business Relationship; School Role; Skill Development; Technological Advancement; Technological Literacy Transfer of Training; Trend Analysis; *Vocational Education

Technological Literacy: What Industry Can Offer. Ideas for Action in Education and Work. Northwest Regional Educational Lab., Portland, OR. Education and Work Program. Nov 1984

This report represents actual business and industry practices to support schools as reported by business and industry representatives, teachers, state and local administrators, and professional and trade organizations. These efforts are divided into (1) direct services to students, (2) skill enrichment for teachers, (3) contributions,

and (4) policy development. Each practice is briefly described. These types of direct services to students are discussed: visitations to trade shows; onsite use of equipment; tutors; job shadowing; loaned personnel; student work experience/cooperative education; hosting classes; field trips, tours, visits; career days, tele/video communications; display/mobile units; sponsorship of events; and youth organizations. These types of skill enrichment for teachers are described; trade missions, internships, inservice classes, and open enrollment in industry classes. Contributions include donated equipment, financial support, awards for excellence, hidden support, and materials and software. These forms of policy development are covered: advisory committees, technical assistance, and job market analysis. Ways in which schools can provide services to local business and industry in return for private sector help are then described, including instruction in school or work site, use of school facilities/resources, subcontracts and sales of products and services, and management assistance. Print and equipment resources and resource organizations are listed. YLB)

Descriptors: Career Education; Cooperative Education; *Coop-Teacher Education; Job Skills; Policy Formation; Postsecondary Education; *School Business Relationship; Secondary Education; Technical Assistance; *Technological Advancement; *Technological Literacy; Vocational Education; Work Experience

Identifiers: *Corporate Support

Tweeten, Luther. High Technology in Rural Settings. State-of-the-Art Paper. Tennessee Univ., Knoxville. Office for Research in High Technology Education. Dec 1984 65p.

The purpose of this paper is to identify the role of high technology in rural-to-urban and urban-to-rural movement and the implications of this technology for agriculture and rural areas. The first section of the paper considers the impact of technology on agriculture in the United States over the past 50 years. Because U.S. agriculture has undergone unprecedented technological change since the 1930's, this provides an excellent case study of the effects of technology. Section 2 examines the potential impact of high technology on rural people and areas and concludes that high technology will influence rural areas more as users than as producers of such technology. The next two sections focus on two major high technology users--the farming industry and local rural government and schools. Applications of computers in agriculture and telecommunications in marketing are described, forecasts of future microcomputer uses on farms are made, and selected applications by the public sector are considered. The final section addresses some underlying issues (posed as questions with brief answers and supporting arguments) about high technology's effect on economic efficiency and equity, educational needs, and philosophical concerns. (YLB)

Descriptors: Agricultural Education; Agricultural Occupations; *Agriculture; Educational Needs; *Rural Areas; *Rural Population; Rural to Urban Migration; State of the Art Reviews; *Technological Advancement; *Technology Transfer; Urban to Rural Migration; Use Studies; Vocational Education

Identifiers: *Impact

Battu, Daniel Pierre and John B. Rose. Telecommunication Services for the Transfer of Information and Data: A Case Study in Indonesia. United

Nations Educational, Scientific and Cultural Organization, Paris (France). General Information Programme. Jan 1984 99p.

This study on the use of telecommunications to improve access to the specialized information needed for development was conducted by a national team and carried out through a series of meetings in Jakarta and Bandung. Persons contacted included Indonesian officials responsible for national development in information and telecommunications, actual and potential major users of data communications, and officials of two regional organizations. A general discussion of the Indonesian situation is followed by a review of current data communication technology, including computer networks, data networks, and ISDN (integrated services digital networks); packet switched data networks; satellite communication; the SATNET experiment; and tele-informatics services. The existing Indonesian telecommunications network is described as well as the development of national telecommunications services, PACKSATNET, and international facilities and regional cooperation. Specialized, organizational, and general information services and needs are discussed, and national strategy options are examined with a look at development strategy for a National Packet Switching Network (NPSN), telecommunications technology for the NPSN, improvement of access to PACKSATNET through PSTN (public switched telephone network) connections, international data connections, Telex aspects, operational aspects and maintenance, databases and computer facilities, tele-informatics services, and investments. International strategy options are also addressed. Conclusions and recommendations cover national policy, regional and international cooperation, marketing and tariff strategy/user awareness, investments, human resources, standards/local manufacture of equipment, and research and development. Twenty-eight references, eight

appendices, and sixteen figures are included. (LMM)

Descriptors: Case Studies; Databases; Delivery Systems; *Developing Nations; Information Dissemination; *Information Needs; *Information Networks; *National Programs; Policy Formation; Technology Transfer; *Telecommunications

Identifiers: *Indonesia; International Telecommunication Union; UNESCO

Coles, James S., Ed. Technological Innovation in the 80's. American Assembly, New York, N.Y. 1983 202p.

This six-chapter book presents background papers used by participants at a meeting designed to examine the prospects for and roadblocks to scientific and technological innovations as the 21st century is approached. They include: (1) "Research Universities and Industrial Innovation in America" (Steven Muller); (2) "The Role of Government in Scientific Innovation" (Donald F. Hornig); (3) "Improving American Innovation: The Role of Industry in Innovation" (Robert A. Frosch); (4) "Enhancements and Impediments in the Innovation Process" (Willard Marcy); (5) "The Government-Industry-University Interface: Improving the Innovative Process" (Niels Reimers); and (6) "Current Trends in Mathematics, Science, and Technology Education: Implications for Technical Innovation" (Cecily Cannan Selby). These chapters assess the development of American technology from the importantly useful inventions by 19th century individuals to the extensive research of today's federally sponsored space and nuclear programs, reconcile the upcoming needs of society with economic factors, propose public policies that will promote scientific innovation and hasten its move from research laboratories into practical and commercial use and, by analyzing interrelationships of government, industry, and the university,

pinpoint roles that these institutions should play in the process of fostering and marketing technological innovations and widespread scientific and technological literacy. (JN)

Descriptors: Educational Trends; Elementary Secondary Education; *Government Role; Higher Education; *Industry; *Innovation; Mathematics Education; National Security; Public Policy; *School Business Relationship Science Education; Scientific Literacy; *Technological Literacy; *Technology; Technology Transfer

Identifiers: *Industry Role

Hurd, Paul DeHart. Reforming Science Education: The Search for a New Vision. Occasional Paper 33. Council for Basic Education, Washington,D.C. 1984 24p.

Several issues in science education are examined, including those related to the current concern about science education, technology in the science curriculum, redirection of the science curriculum, uses of knowledge, decision making in human affairs, organization of the curriculum, and science and vocational education. It is suggested that much of the confusion on these and other issues arises from a failure to recognize that the purposes of science education are changing, that new subject matter is being introduced, and that the context of the curriculum is shifting from that of the disciplines to human affairs. This new view of science education as a common education in science and technology is compared with prevailing views of science education programs as they exist in schools today. Areas compared include rationale and goals of science education, subject matter cognitive processes, value and ethical considerations, textbook role, and the type of understanding fostered by instructional strategies. For example, current goals for teaching science are internal to scholarly fields of

scientific research while goals related to the new view are based on scientific and technological systems in social, cultural, and individual contexts. (JN)

Descriptors: Cognitive Processes; Comprehension; *Curriculum Development Decision Making; *Educational Objectives; *Educational Trends; Elementary Secondary Education; *Science Curriculum; *Science Education; Science Education History; *Science Instruction; Technological Literacy; Vocational Education

Identifiers: *Science and Society

Carey, John and Mitchell Moss. A Review of Telecommunications Technologies and Public Broadcasting. Corporation for Public Broadcasting, Washington, D.C. Jan 1984 88p.

Intended to help public broadcasters make informed decisions on the use of the new technologies to enhance their services and programming, this report outlines the relative strengths and weaknesses of new applications, describes selected options that may be available to public broadcasting, and provides cost and market projections to enable broadcasters to make reasonable assessments of how the markets for new technology are developing and services that public broadcasting can provide. Capabilities of the new technologies are explained, as well as how these characteristics relate to user needs and public broadcasting's mandate. A historical perspective on the development of new communications technologies is followed by descriptions of 14 technologies that may be available to public broadcasting. These technologies are analyzed in terms of their market development and potential applications: teletext, videotext, specialized cable, interactive cable, videocassettes, teleconferencing, microcomputers, high definition television (HDTV), low-power television (LPTV), subscription television (STV), multipoint distribution services (MDS), digital audio, subsidiary com-

munications authorization (SCA), and direct broadcast satellites (DBS). Thirty-four tables display data on market growth and a 10-item bibliography is provided. (LMM)

Descriptors: *Cable Television; Marketing; Microcomputers; *Prediction; *Programming (Broadcast); *Public Television; Technological Advancement; *Technology Transfer; Teleconferencing; Videodisc Recordings; Videotape Cassettes; Videotape Recordings; Videotex

Identifiers: *Interactive Video; Video Games

Information Technology for Agricultural America. Prepared for the Subcommittee on Department Operations, Research and Foreign Agriculture, 97th Congress, 2d Session. Committee Print. Library of Congress, Washington, D.C. Congressional Research Service. Dec 1982 367p.

This summary of the combined Hearing and Workshop on Applications of Computer-Based Information Systems and Services in Agriculture (May 19-20, 1982) offers an overview of the ways in which information technology--computers, telecommunications, microforms, word processing, video and audio devices--may be utilized by American farmers and ranchers. Governmental and private sector perceptions of the importance of providing information support to agricultural America described as well as initiatives that have been undertaken to meet the information technology needs of the agriculture industry. Following a detailed treatment of letter narratives taken from letters to the Congressional Subcommittee on Department Operations, Research, and Foreign Agriculture, the formal hearing testimonies augmented by the findings and recommendations of the workshop discussion groups are examined at length. Workshop recommendations are organized by discussion group focus: (1) private sector information services; (2) government information services: management and marketing; (3) government information field operations; (4) user requirements; (5) system implementation: hardware installation training, main-

tenance, software and data file modification; and (6) present and projected technology. Appendices feature complementary material including descriptions of technology-supported information services, and a list of hearing and workshop participants, information on key legislation, and a five-page reference list. (LMM)

Descriptors: *Agriculture; Audiovisual Aids; *Computer Oriented Programs; *Government Role; *Information Services; *Legislation; Microfilm: Online Systems; *Technological Advancement; Technology Transfer; Telecommunications; Videotex; Word Processing

Identifiers: *Information Technology

Case, Donald and Hugh Daley. Personal Computers: The New Academic Medium. Paper presented at the Annual Conference of the International Communication Association (33rd, Dallas, TX, May 26-30, 1983). 19p

As a part of a larger research project intended to aid university planners, 2,027 faculty and staff at a large western university were questioned about their interest in telecommunications services. Of those surveyed, 366 faculty and 466 others--41% --returned the lengthy mail questionnaire, which included questions about computing, videotex, and conventional television programming. Results related to computer, adoption and use indicate that 135 respondents owned a personal computer, while 331 others planned to buy one within the next 5 years. The primary use reported for the personal computer was writing,while comparisons of actual uses by owners with intended uses by non-owners suggest that heavily-advertised uses such as financial management or database access are relatively unpopular. The personal computer, therefore, has become a means of communication, despite advertising that neglects this function of the device. Because of its increasing presence in the home and on the university campus, the use of personal computers deserves further study. (Author/LMM)

Descriptors: Adoption (Ideas); *Advertising; Higher Education; Home Programs; Information Services; Marketing; *Microcomputers; *Purchasing; Technology Transfer; Telecommunications; *Use Studies; *Word Processing

Identifiers: *Computer Users

Werneke, Diane. Microelectronics and Office Jobs. The Impact of the Chip on Women's Employment. International Labour Office, Geneva (Switzerland), 1983 102p.

As labor-saving, efficiency-increasing electronic technology is introduced into offices, jobs held by women will change. Although some jobs may be lost, most job loss will be absorbed by attrition and reduction of waste. Fewer new openings may occur in office jobs, however, especially in a recessionary economy. On the other hand, the jobs that are created may require skills that women do not have, especially mathematical and spatial-relation skills. Other new jobs may be de-skilled, leading to a loss in recognition and pay through specialization and assembly-line techniques; these jobs may dehumanize women in the same way that assembly-line work has sometimes dehumanized their male counterparts. If women are to benefit from the coming job changes, appropriate action will be required now in schools, training establishments, and businesses to encourage women to acquire the broad-based, analytical skills that they will need. Government officials, employers, and trade union leaders each have a role to play, but the central effort must come from working women through their understanding of the issues and participation in the process of change. (KC)

Descriptors: Adults; Automation; Clerical Occupations; *Computers; Cost Effectiveness; *Educational Needs; *Employed Women; *Futures (of Society); Job Simplification; Job Skills; Job Training;

Labor Utilization; Modernization; Obsolescence; *Office Occupations; Productivity: *Technological Advancement; Technological Literacy; Unions; Vocational Education

McCormick, Robert W. Vocational-Technical Education Interface with Ohio's High Technology Business and Industrial Sector. Final Report. Ohio State Advisory Council for Vocational Education, Columbus. Apr 1983 41p.

This study explored the relationship of vocational-technical educational institutions in Ohio with business and industry using high-technology applications. The study attempted to determine what high-technology applications will be adopted by Ohio's business and industry in the next 5 years, what experience the schools have had in working with high-technology industries, what skills are needed by employees and students entering this job market in the next 5 years, and how these educational needs can be met. Personal interviews were conducted with 32 educators and 15 industry executives in the manufacturing area. The study found that although the executives are supportive of vocational education, they do not view vocational education as a resource for training persons for high-technology positions. The executives pointed out that vocational education is usually carried out on the high school level and they would not want high school graduates working on their high-technology machinery. Instead, the executives expect to do most of their own in-plant training for high-technology jobs. They want to employ technical education graduates of two-year or four-year colleges for these positions. The consortium approach between business and education appears promising and has worked well where tried. One job tackled by the consortium approach has been the retraining of instructors to teach high-technology subjects. The executives stressed that students should take mathematics, science, and computer courses in order to qualify for industry training in high-technology companies.

This could be provided in a "pre-technical" high school vocational education option. (KC)

Descriptors: Curriculum Development: *Educational Needs; Educational Trends; Education Work Relationship; *Employer Attitudes; Futures (of Society); Postsecondary Education; Program Improvement; *School Business Relationship; Secondary Education; *Technical Education; Technical Institutes; Technical Occupations; Technological Advancement; Technological Literacy; *Vocational Education

Identifiers: *High Technology; Ohio

Groff, Warren H. Utilizing Research and Development Products in Strategic Planning and Human Resource Development in the Computer Literate, High Technology, Information Society. Paper presented at the Annual Nationwide Vocational Education Dissemination Conference (5th, Columbus, OH, Nov 17-19, 1982). 49p.

Stressing the importance of the relationship of vocational and technical education to the economy, this paper discusses how existing educational research and development (R&D) resources can assist in preparing for the computer literate, high technology, information society. After emphasizing the magnitude of the education and training industry, the paper explains that in the 1970's, educational institutions began adopting the concept of strategic planning to meet changing external demands. The next section examines the current transformation from a material-producing to an information-producing society, citing the impact of computerization on business and post-secondary education. Next, the components of the R & D dissemination network useful to occupational education is examined. A model is then presented for utilizing R&D products in strategic planning are identified as assessing opportunities and threats in the external environment, auditing the strengths and weaknesses of the organization's internal environment, and matching strengths with opportunities. Finally, the use of R&D products in pursuing

the strategic options of improving program quality, meeting the needs of the new student clientele, participating in economic development and technology transfer, and undertaking comprehensive planning is emphasized, and examples are provided. Charts illustrating the paper's major points and a list of resources are included. (DAB)

Descriptors: College Planning; College Role; *Educational Planning; *Educational Research; *Human Resources; Institutional Research; *Organizational Development; Organizational Objectives; Social Change; Technological Advancement; Technological Literacy; Technology Transfer; Vocational Education

Stewart, David W. The Diffusion of Innovations: A Review of Research and Theory with Implications for Computer Technology. Paper presented at the Annual Convention of the American Psychological Association (Washington, DC, August 1982). Aug 1982 12p.

A review of the general literature on diffusion, innovation, and social change is worthwhile as a basis for developing more effective methods for facilitating the adoption of computer-used technologies. Much of the research on diffusion has focused on (1) characteristics of the innovation which influence the diffusion process, (2) a description of the adoption process over time, and (3) characteristics of both individual innovators and innovative organizations. Once innovators in an organization have been identified, information should be supplied to them, emphasizing the relative advantages of the innovation, i.e., computer-based technologies, and a trial and error period should be provided. Developing internal advocates and insuring trial do not complete the adoption process, however, and resistance may still be substantial. Approaches to reduce resistance can include establishment of work teams, modification of organizational procedures to encourage use of computer technologies, and consideration of human factors. Those charges with implementation of these

technologies can benefit from a review of the work of consumer psychologists and others involved in new product marketing. The current computer revolution will be painful and disconcerting to some, threatening to many, and will have an impact on nearly everyone. Psychologists can employ their knowledge to facilitate the inevitable transition to a computer-oriented society. (LMM)

Descriptors: *Adoption (Ideas); *Change Agents; *Change Strategies; *Computer Oriented Programs; Diffusion (Communication); *Innovation; Literature Reviews; Marketing; Organizational Change; *Program Implementation; Technology Transfer.

Beal, George M. Knowledge Generation, Organization Dissemination and Utilization for Rural Development. Paper presented at the World Congress for Rural Sociology (5th, Mexico City, Mexico, August 7-12, 1980). 7 Aug 1980 20p.

A "communication system" paradigm for dissemination of appropriate knowledge, information, and technology needed for effective rural development is briefly described. The paradigm describes six categories of interrelated functions, activities, and processes: (1) scientific knowledge production by carrying out basic and applied research; (2) Knowledge-management, where information is monitored, screened, indexed, catalogued, packaged, and stored in an accessible and retrievable form; (3) knowledge-translation, which synthesizes and converts scientific research into information useful to product-developers attempting to formulate solutions to practical problems; (4) product development, which combines scientific knowledge with knowledge of user needs, and develops products which have the potential of meeting whose needs; (5) product-dissemination, which involves understanding the product and its uses, designing dissemination and communication strategy, distributing, adapting, and installing the product, and monitoring the product performance; and (6) product-adoption/utilization, by which users discover and diagnose problems,

locate, try-test, adopt, and assimilate solutions into existing systems. A hypothetical example shows that a linear flow of knowledge information from basic research to the ultimate user need not be assumed in using the paradigm to improve dissemination of information rural development. (JD)

Descriptors: *Communications; *Information Dissemination; *Information Networks; *Information Utilization; Linking Agents; Marketing; *Rural Development; Scientific Enterprise; Systems Approach; *Technology Transfer

Beuke, Vernon and Steven Farrar. A Review of the Change Literature with Implications for ISSOE Dissemination. Second Printing. State Unive. of New York, Ithaca. Cornell Inst. for Research and Development in Occupational Education. Sep 1979 33p.

The state of the art in the implementation of education innovation is assessed in three parts: (1) the identification of promising theories, important issues, and proven implementation strategies with emphasis on practical implications; (2) a review of research directly related to the development and implementation of new occupational education programs; and (3) a distillation of the literature in the form of generalizations about innovations and innovative organizations. Four models of change which have guided innovation (the Research, Development, and Diffusion; Problem-Solver; Social Interaction; and Linkage models) are proposed. The process of adoption is represented by stages of adoption behavior and by adoption and diffusion curves. The Power, Re-Educative, Manipulative, and Marketing Technology Strategies for implementation are also identified and reviewed. A review of major studies of innovation in vocational education concludes that the ability to be innovative includes a perceived need to change, acquisition of a well-packaged program which responds to that need, and some level of commitment

and administrative ability. Five organizational variables are identified as factors which influence the implementation of innovation: financial resources, human resources, the planning process, communication channels and patterns, and training. Aspects of the innovation itself which are identified as affecting its successful implementation are adaptability and utility. (YLB)

Descriptors: *Adoption (Ideas); *Change Strategies; Diffusion; *Educational Change; *Educational Innovation; Educational Research; Information Utilization; Literature Reviews; Models; Program Development; Research Utilization; *Technology Transfer; Vocational Education

TECHNOLOGY IN RETAILING

Consistent with the desire of this project's goal of examining the total picture of technology in marketing, the picture would be incomplete without a special chapter devoted to the way in which technology has impacted retailing. Clearly technology is having a marked impact on retailing. Electronic data processing of store transactions is revolutionizing the retailing industry even while newer and more improved hardware and software applications are being developed almost weekly.

The goal of technological advances in retailing is to provide a more effective and efficient means of making management decisions in the traditional retailing mix: pricing, promotion, merchandise management, buying, store operations and personnel.

- Pricing - The major problem confronting retailers is knowing how various prices affect supply and demand. Advances made in electronic recordkeeping allow for prices to be raised and lowered consistent with sales and turnover of specific items. Good merchandisers can now relate prices and margins to turnover and sales of specific items thereby greatly enhancing a business's profitability.
- Promotion - With electronic cash registers,regular coupons, cents-off coupons and various pricing schemes can provide accurate data on how store promotions are working.
- Merchanise Management - The key to sound merchandise management is knowing which items are moving fast and which are moving slow. Point of Service systems provide just this information by quickly analyzing which merchandise, styles, colors and lines of which supplies are selling best. Increased profitability results from knowing this information.

- Buying - Proper inventory management is at the heart of the buying process. Failure to modify the retailing mix based on consumer response to product lines leads to poor purchase order management. In poor purchase management excessive mark-downs can cost thousands of dollars in profits. The software programs available in inventory control permit quick identification of poor stock.
- Store Operations - Fast, accurate information on markup percentages, sales patterns, out-of-stock merchandise is readily available from electronic Point of Sales equipment. In addition, information such as which sizes, colors and prices are selling is also available. This translates to more efficient store operations.
- Personnel - Two of the most difficult areas in retailing are employee evaluation and training of personnel. Both of these are greatly enhanced with emerging technology. The sales of individual departments, managers and sales employees can be quickly evaluated by gauging the volume of merchandising moving through cashier stands. Training time is reduced because, since all sales procedures are standardized, employees can be moved freely between departments.

The rapid expansion in use of point of service cash register terminals paralleled the adoption of the universal product code (UPC) by the food industry and the optional character recognition system (OCR-A) by the National Retail Merchants Association. Today all major chains use these systems and an increasing number of retailers use some form of the systems. Point of service systems in large retail chains are linked to data centers which evaluate personnel, warehouse inventory and other sales related data on a daily basis. Discount stores typically use POS systems only within their

own stores, while supermarket chains use POS systems at the store, regional and corporate levels.

SUMMARY

The face of retailing is being changed daily by the technological revolution. While the day may come when retailing is so transformed that buying decisions may be made on a monitor in the home linked up to remote markets, for now the primary impact is being made by point-of-service machinery. There are, of course, numerous additional ramifications to high school students interested in retailing. But, since this project is concerned with awareness levels of technology in marketing for the average high school student, these more involved and advanced uses will not be discussed.